



Panel #4

Remedy Effectiveness: Comparison of Remediation Technologies

Thin Layer Dredging and Capping

Recent Case Histories

William Elmer, PE, Foster Wheeler Environmental Corp

John Lally, Foster Wheeler Environmental Corp



Puget Sound Naval Shipyard CERCLA Cleanup



Ward Cove Sediment Remediation



Overview: New Bedford Harbor

Pre-Design Field Test (PDFT)



- PDFT Performed in August of 2000
 - Removed 2,300 cy Over 5 Days
- PCB Concentrations up to 2,600 ppm
- To Prepare for Full Scale Remediation to Remove >600,000 cy from NBH
- Research Performance of New Technology to Meet Specific Criteria

Dredge Performance Evaluation Criteria



- Reasonable and Consistent Production Rates
Especially when Encountering Debris
- High Degree of Vertical Precision (+/- 6 inches)
- Maximize Solids Content, Minimize Water
Volumes Requiring Management & Treatment
- Minimize or Eliminate Sediment Resuspension
- High Degree of Positioning Accuracy
- Ability to Operate in Shallow Water (1-4 ft)
- Control Odors and PCB Volatization



Selection Process

- Initial Plan (ROD) to Hydraulically Dredge
- Evaluated Several Alternative Systems (1999)
- Developed Concept of a Specialized Hybrid Dredge
 - Mechanical Excavator/Hydraulic Transport
 - Mounted on Modular Float System
 - Manufactured Off Site, Assembled on Site
- Bean Environmental LLC (BELLCC)
Fabricated and Operated Specialized Hybrid System



BELLC Test Dredge



BELLC Test Dredge



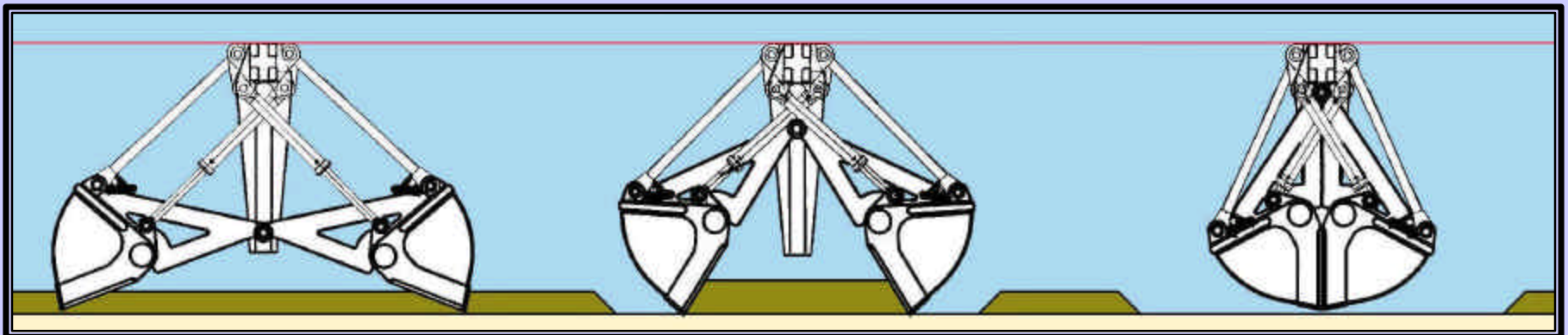
BELLC Test Dredge



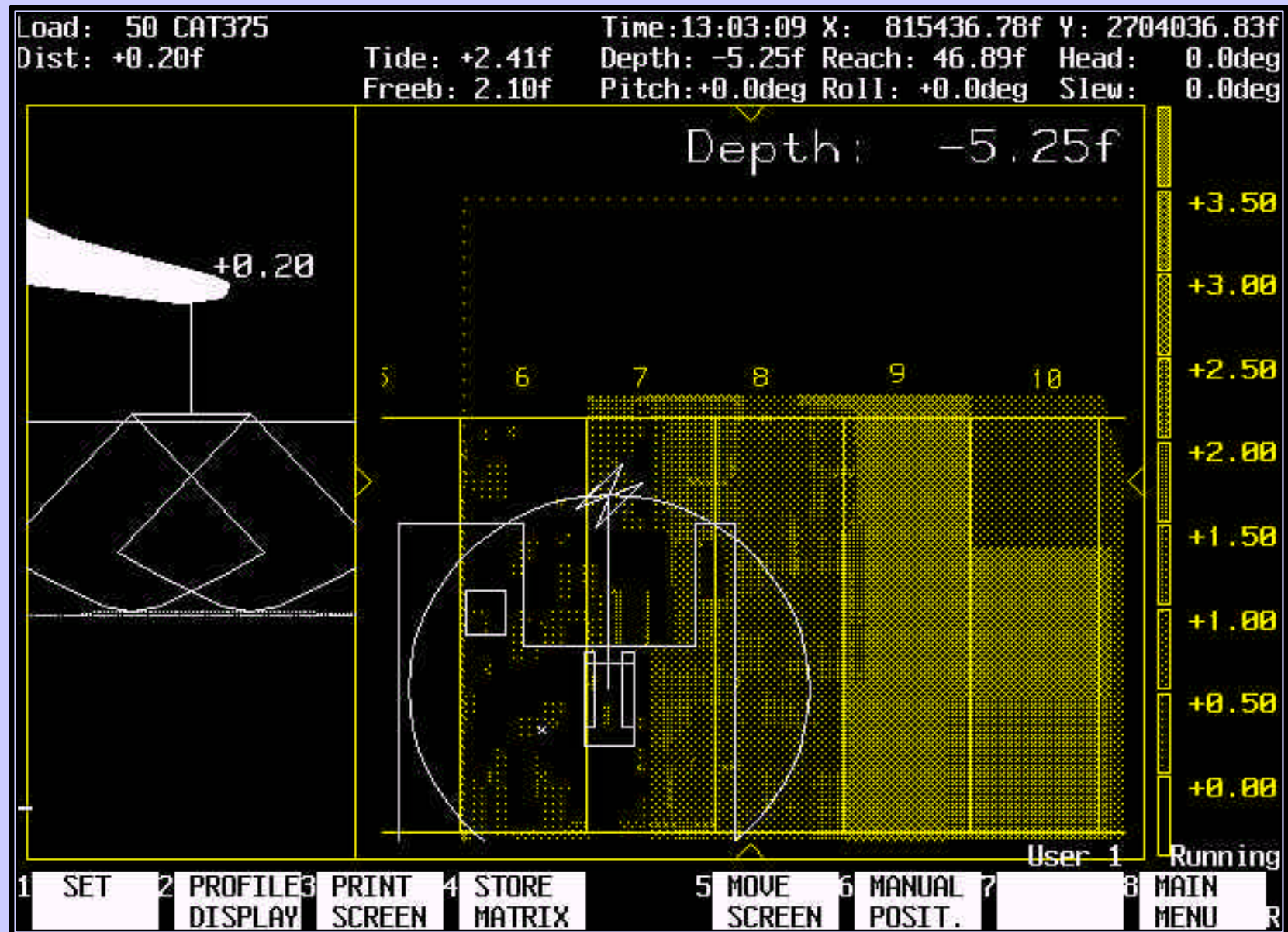
Horizontal Profiling Grab Bucket



- 4.5 cy Bucket
- Full Range of Motion
- Hydraulic Closure
- Sealed Edges
- Level Cut



Crane Monitoring System (CMS)



Dump into Hopper/Grizzly



Water Injection at Patented Slurry Processing Unit



Pipeline Slurry Discharge to CDF



Re-Circulation System



No Makeup Water from Harbor Was Ever Needed for Slurry Production!

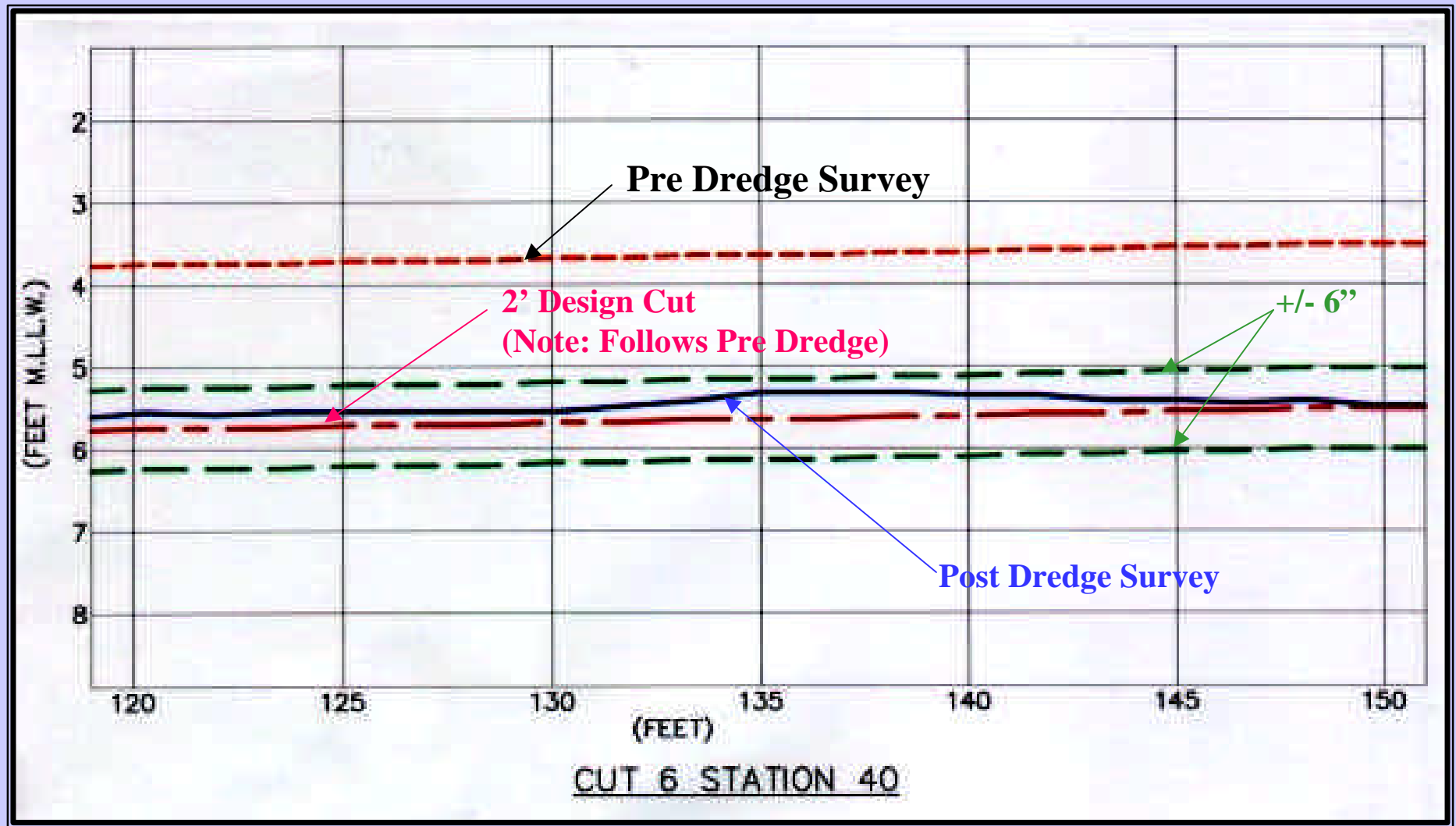




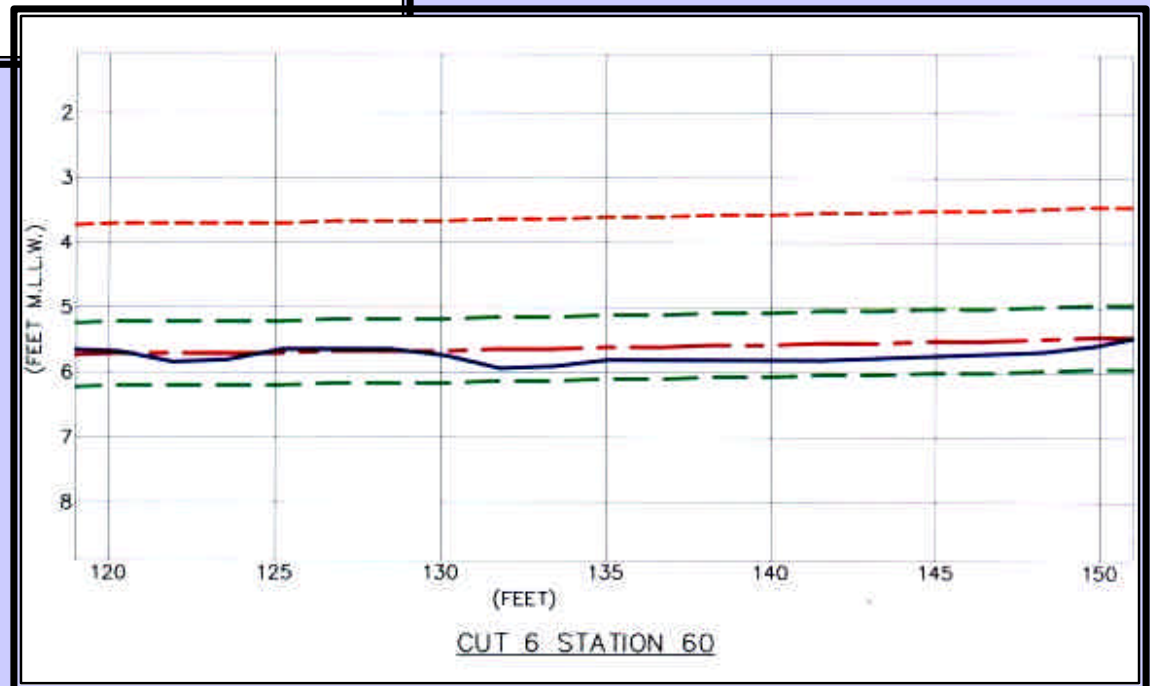
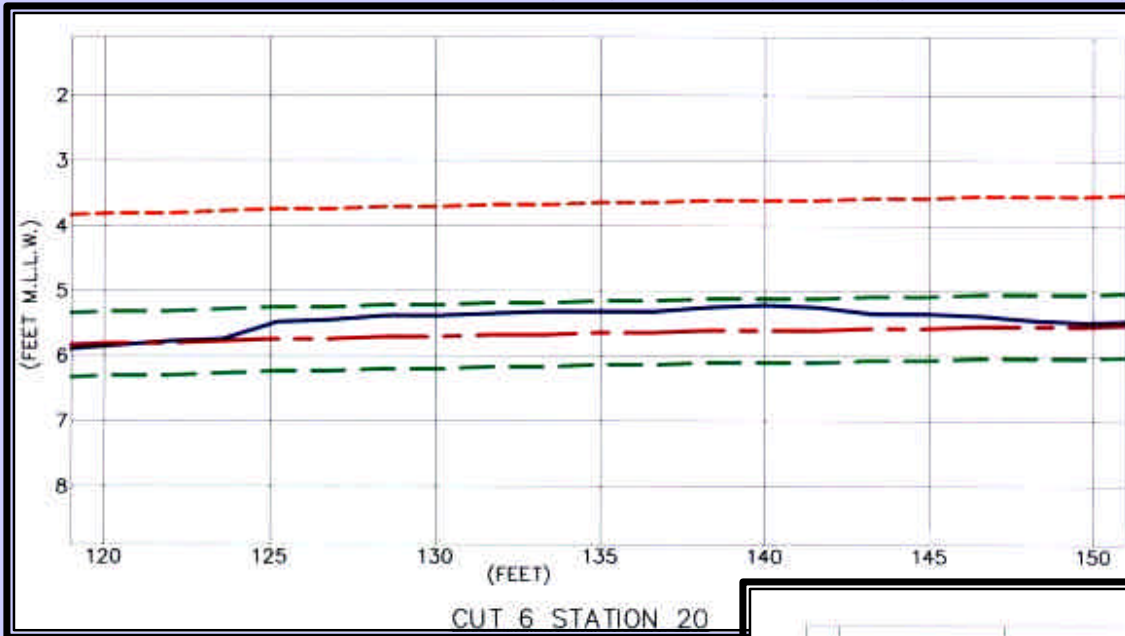
Summary of Success

- Precise Elevation Control (Better than +/- 6")
- No Make Up Water Required
- Handled Debris Satisfactorily - Further Development Needed
- Met Resuspension Expectations During Dredging
- Reached Desired Production Rate (100 cy/hr)
- 97% of PCB Mass Removed from Test Area

Profiles



Additional Examples





Lessons Learned

- Expect Start up Delays w/ Special System
- Have Good Plan in Place for Debris Management
- Size SPU Throughput to Exceed Excavator Input
- Understand Post Dredge Sampling Results
 - Purpose to Evaluate a New Alternative
 - Cleanup Secondary
- Nevertheless Able to Conclude This Was a Very Efficient System Which Can Meet Clean Up Goals

Puget Sound Naval Shipyard CERCLA Cleanup





Overview of the Project

Dredge Volumes:

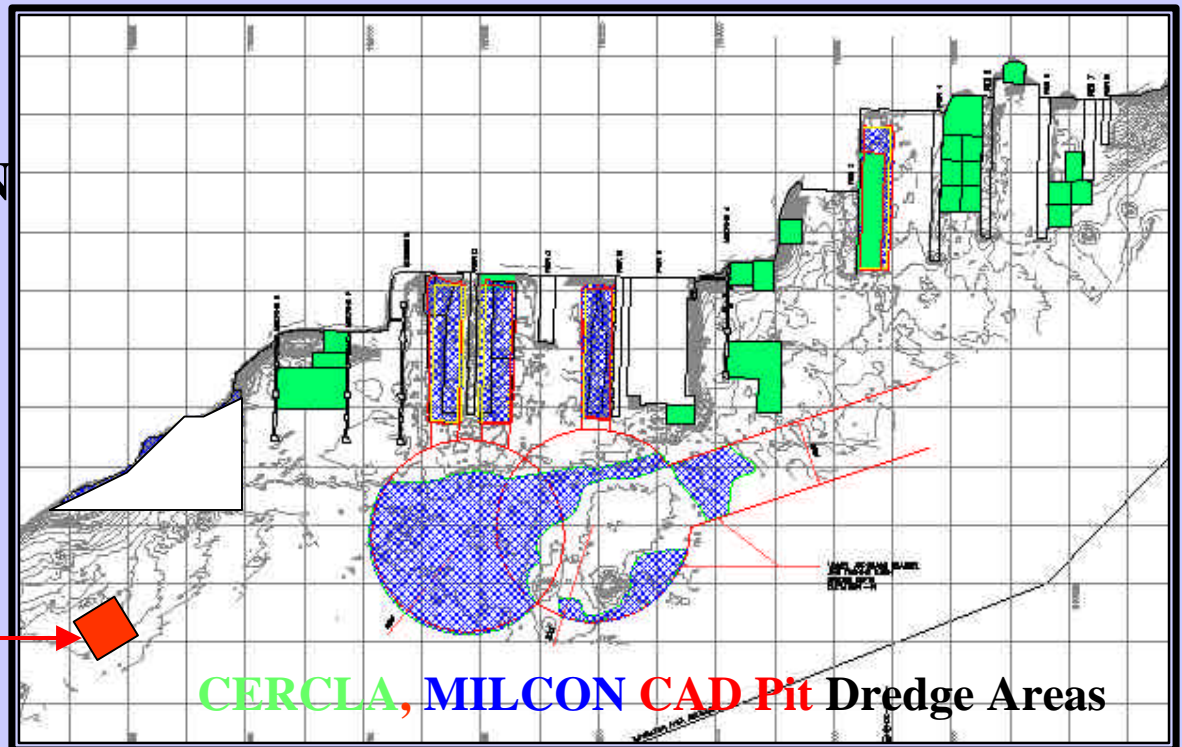
223,000 cy CERCLA

171,000 cy Unsuitable MCON

Total 394,000 cy Contaminated/Unsuitable

All Placed in On Site
Subaqueous Pit CAD

PCB >12 mg/Kg OC normalized or PCB
>6 mg/Kg OC & >3 mg/Kg Hg





Unique Because:

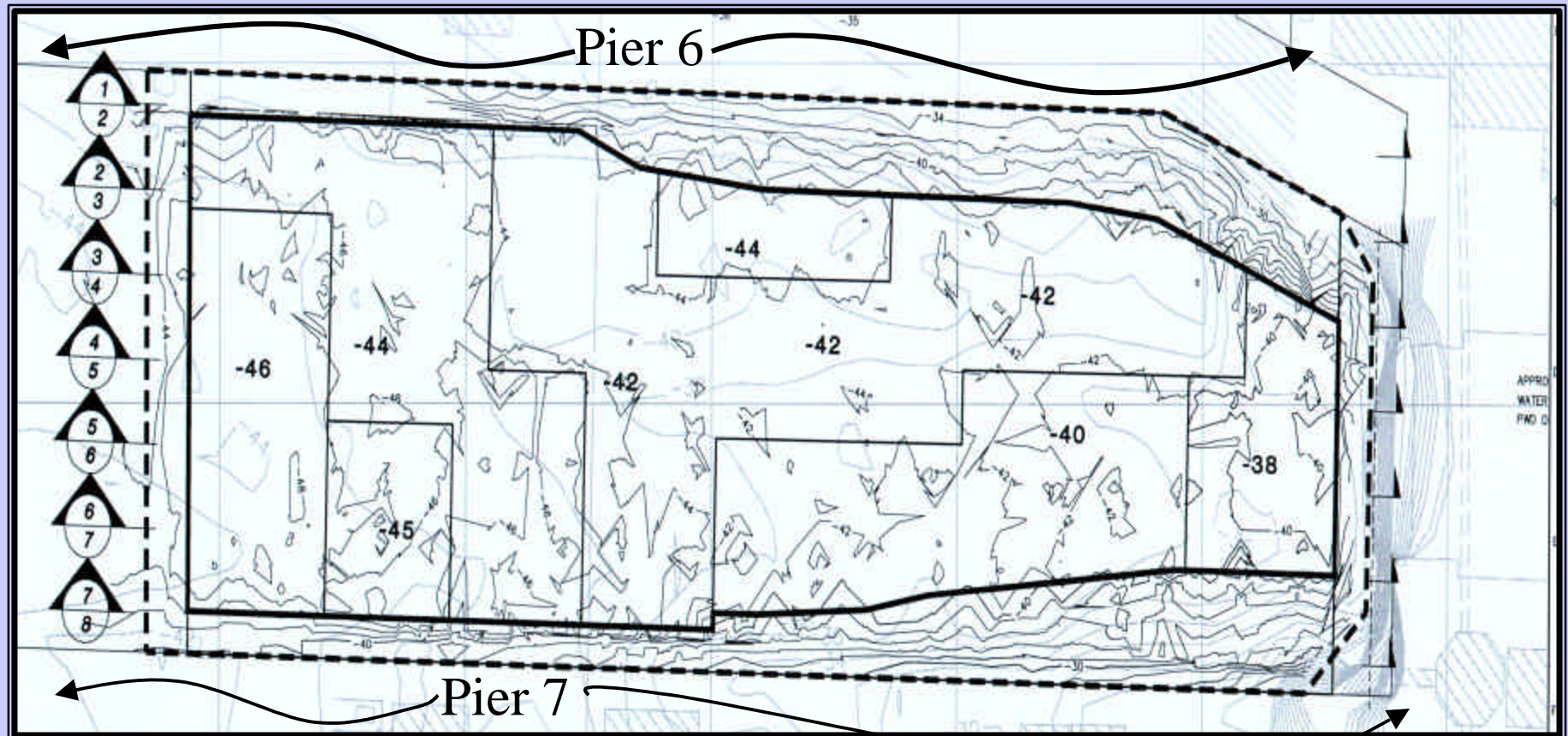
- Volume of Contaminated Material was Significant (>390,000 cy)
- Tight Schedule
- Limited Berth Availability
- Significant Daily Tidal Exchange
- Use of Large Equipment
- 35' to 50'+ Water Depths
- Required Precision Dredging (CAD Pit Volume Constraint)



Awareness!

- At Start Up Worked as if the Project was a Production Project
 - Excessively Rapid Bucket Retrieval
 - Dragging Bucket Horizontally in Water
 - Swinging Bucket While Opening
- Use of “Familiar” Vertical Bucket Control System in Rapidly Changing Tidal Conditions
 - Potential for Under/Over Dredging
 - Old Attitudes and Methods Die Hard

Complex Dredge Plan/Tight Quarters

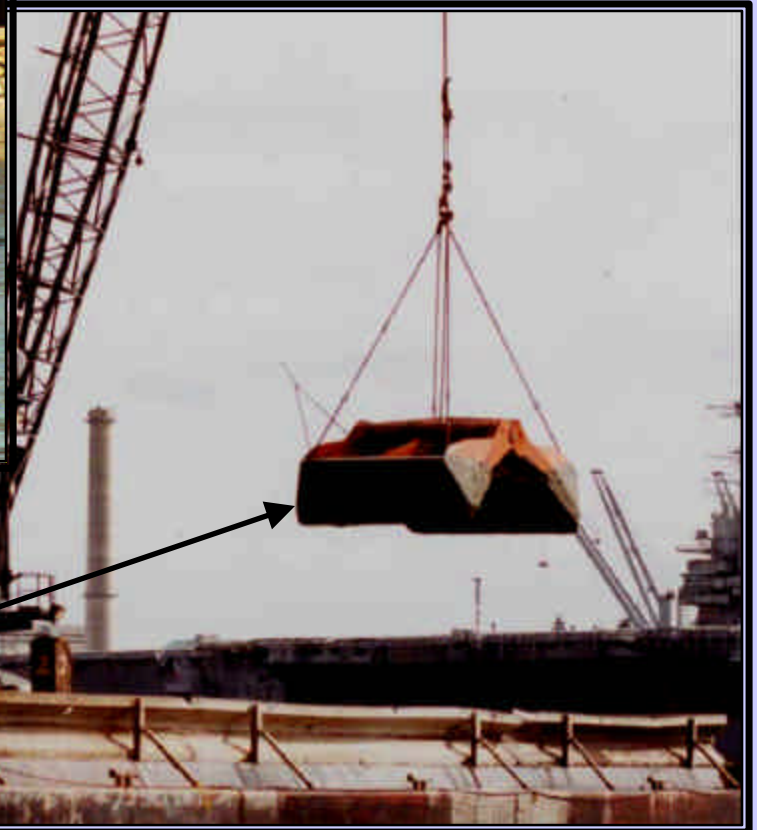




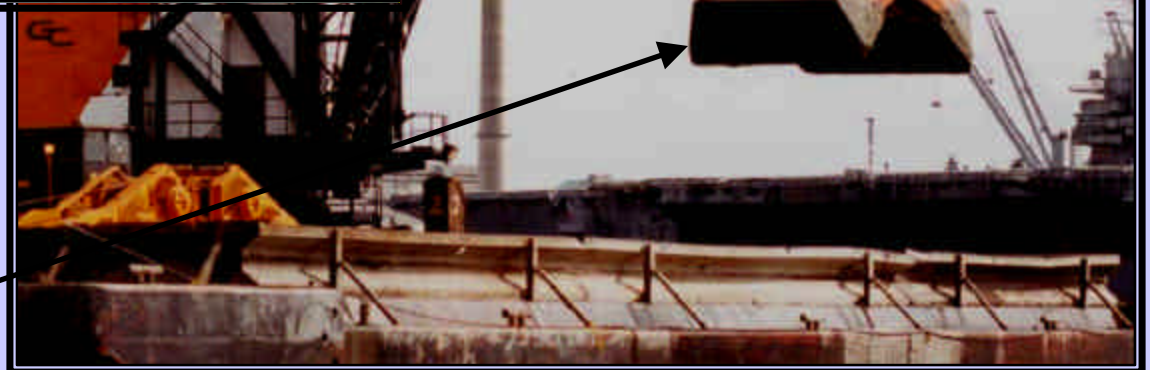
Used Two Types of Buckets



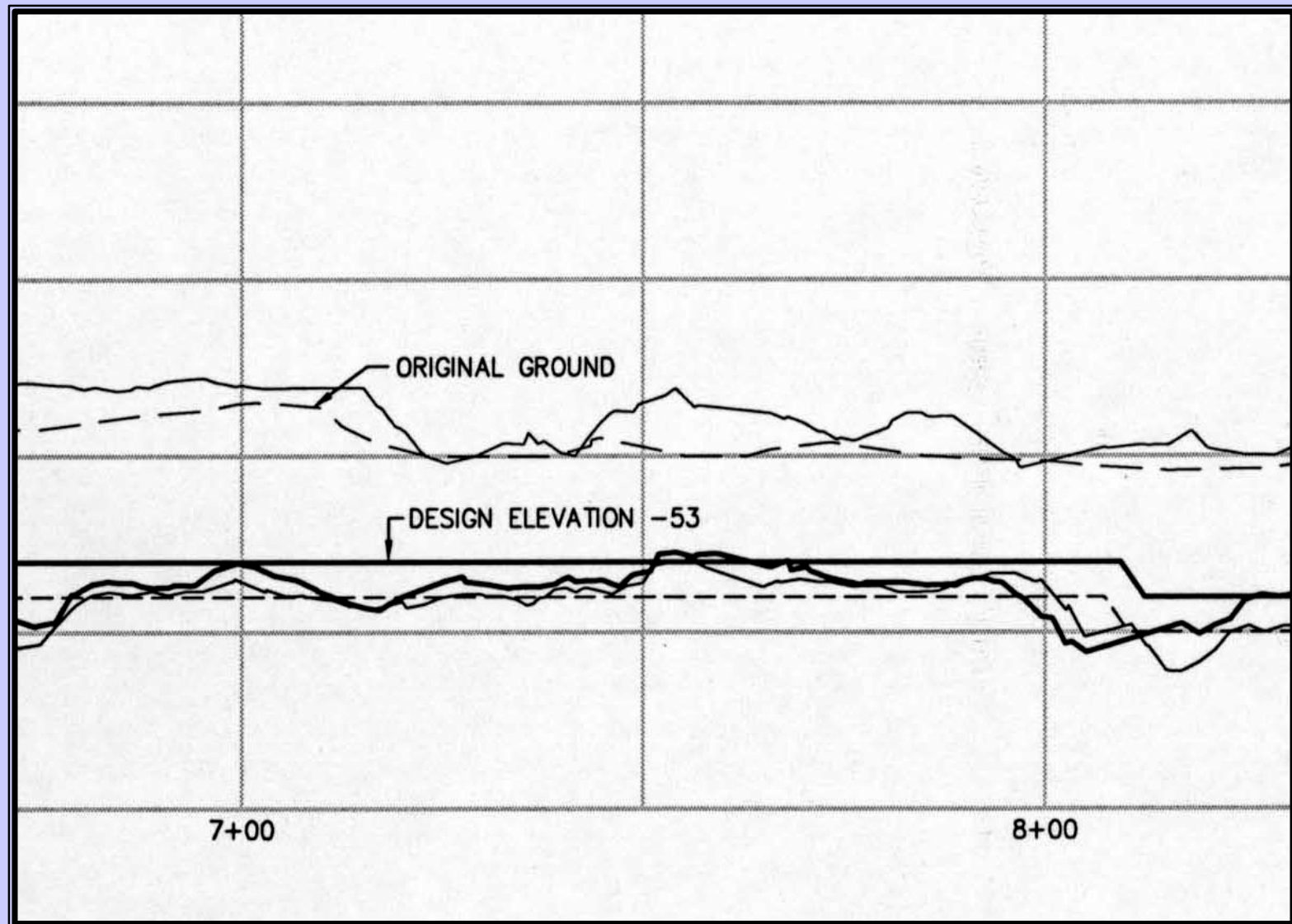
No Difference in
Capability or Effective-
ness Noted



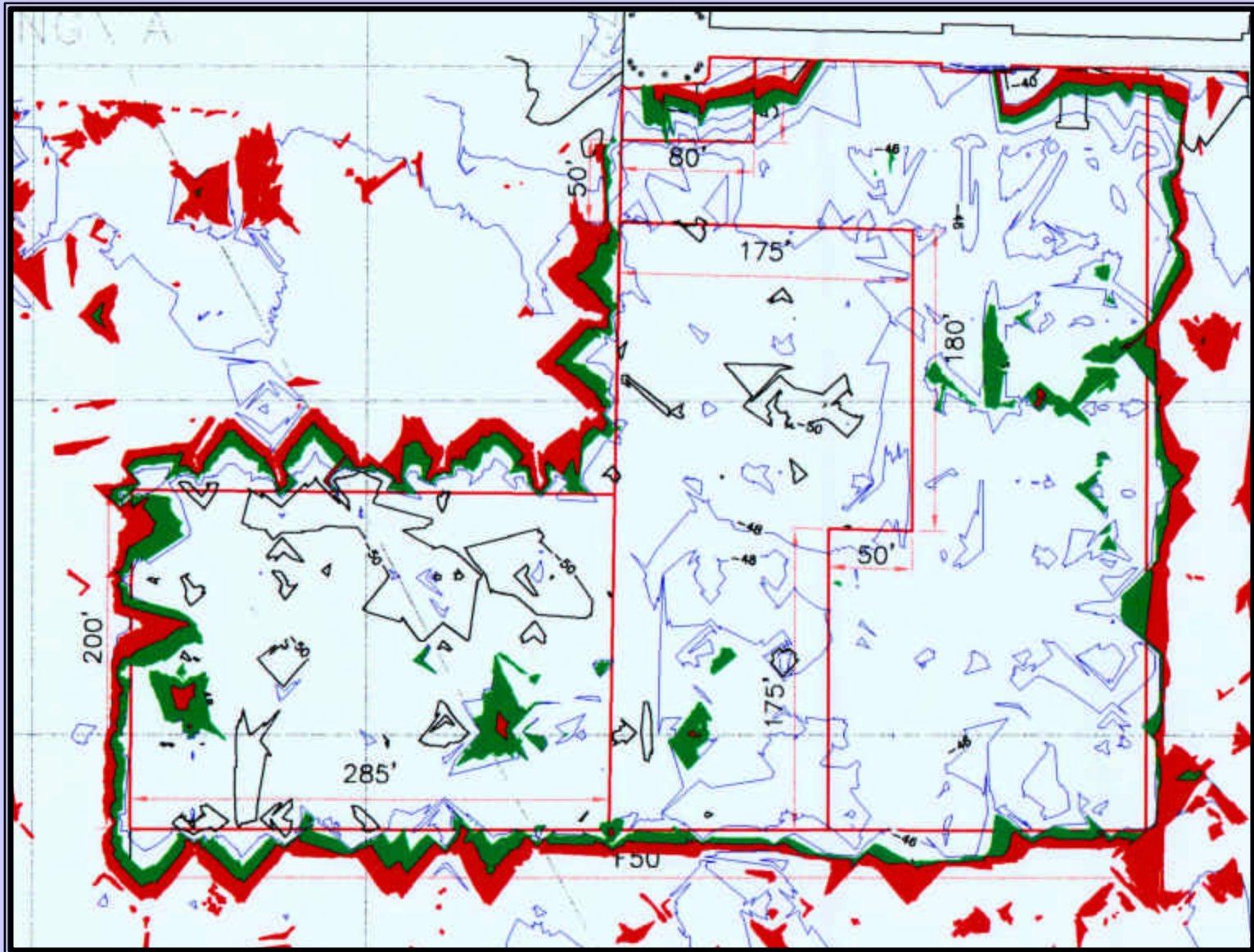
Subcontractor Liked
This Style Better



Successful Results



Post Processing/Reporting





What to Look Out For

- Overfilling Bucket
- Overdredging
- Underdredging

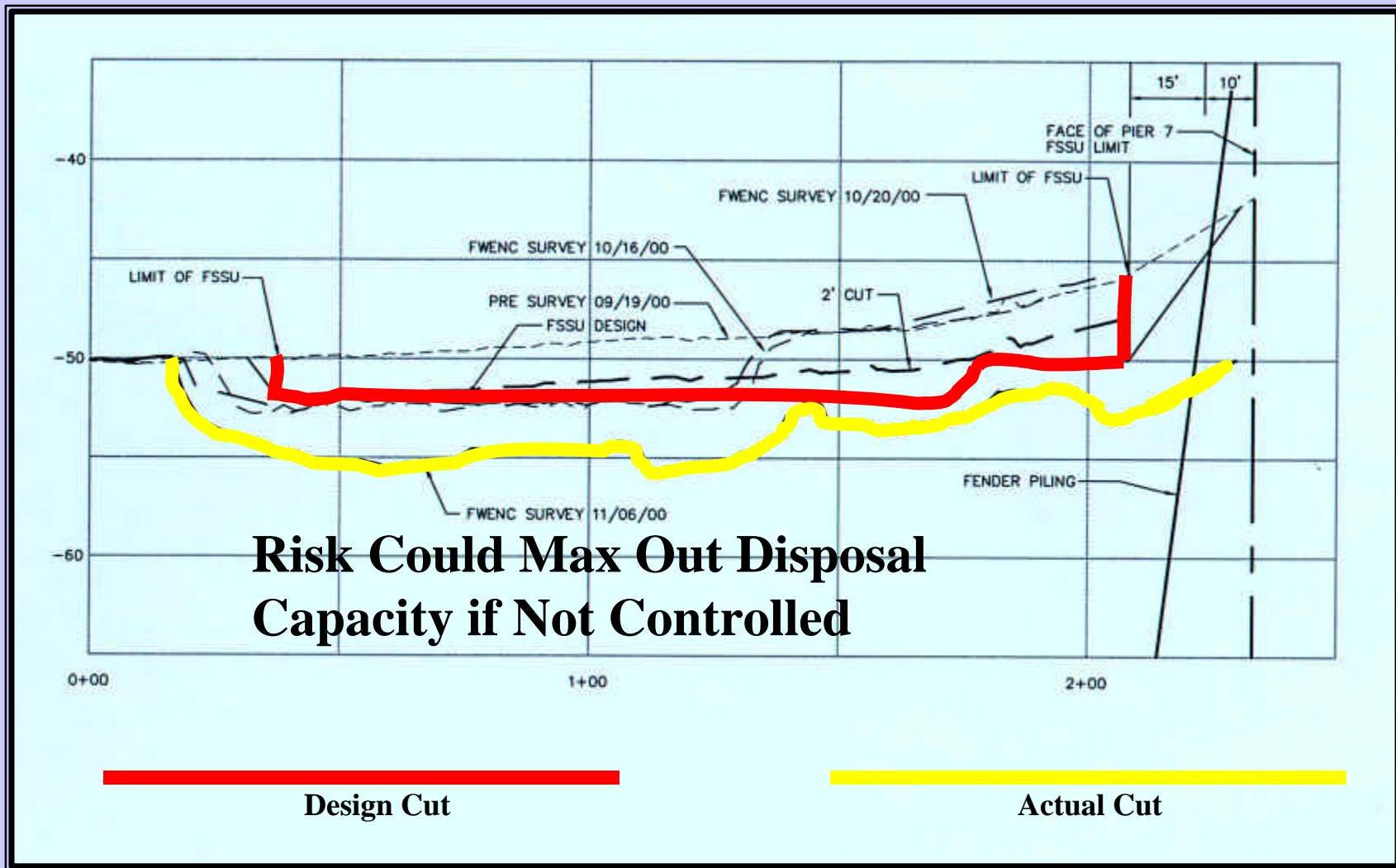
Overfilling = Spills from Vents



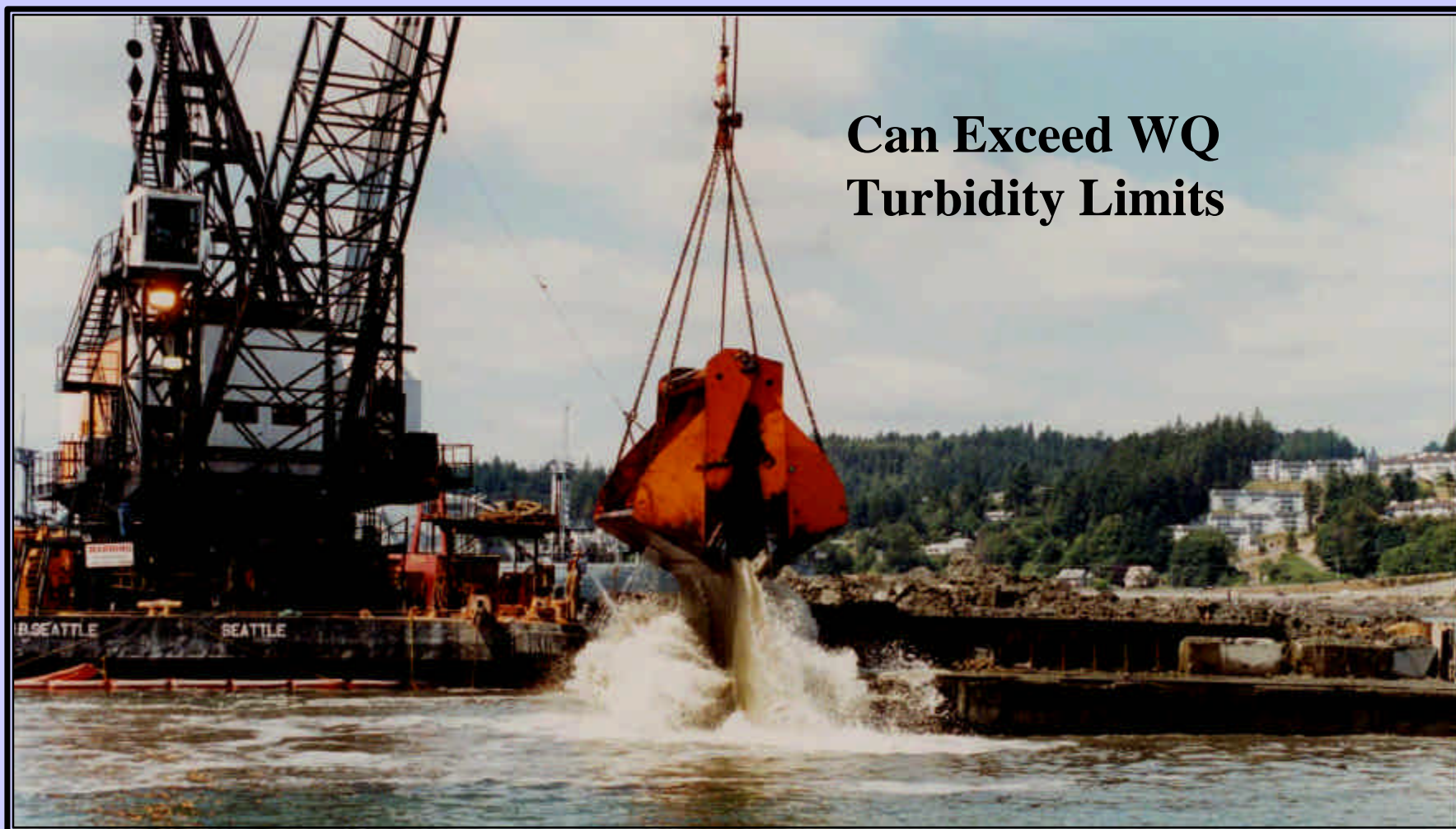
Which Can result in
Water Quality Problems



Example of Overexcavation



Prevent Over/Under **Filling** & Ensure Full Closure



**Can Exceed WQ
Turbidity Limits**



Lessons Learned

- It is Feasible to Successfully Dredge with Large Equipment
- To Do So Must Have an Understanding of the Realities of an **Environmental** Dredging Project
 - Owner/Contractor/Regulator
 - Precision of Cuts
 - Water Quality
- Educate Dredger - Include Operators in Process



Lessons Learned (cont)

- Set Realistic Production Rates.
 - Check Bid Unit Prices - Are They Unrealistically Low?
 - Take More Time. Expect to Pay More for Success!
 - These are not “Production” Projects
- Develop and Use an Electronic Vertical Positioning System with a Heads Up Operator Display
- Consider Full Time On Board Construction Oversight

Ward Cove Sediment Remediation





Overview

- 80 Acre Area of Concern
- Relatively Small Dredging Proj (<10,000cy)
- Significant Capping Project (26.4 Acres)
 - Cap of Very Soft Organic Sediments
 - Anticipated a Multi Stage Approach to Capping
- Successfully Implemented at Stage 1 (One Pass Thin Layer Cap)
 - 6 to 9 inch Sand Cap Successfully Placed By Clamshell

Cap Placement





Excellent Coverage Obtained





Lessons Learned

- Possible to Place Uniform Cap on Soft Sediments with Clamshell
- Requires That a Trial and Error Approach be Used
- Success When a Close Owner/Contractor/Regulator Working Relationship is in Place to Allow Field Modifications to Meet Clean Up Objectives

Co Author and Project Engineer - Everyone Needs a Break!

